



CONTRA COSTA COUNTY

Municipal Climate Action Plan

**Measures to Reduce
Municipal Greenhouse Gas Emissions**

DECEMBER 2008

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1. Introduction

Greenhouse gas (GHG) emissions—the major contributors to climate change—result from almost every human activity, from lighting and heating buildings to driving cars to disposing of waste. The decisions that we make as individuals and governments determine the extent of our impact. Thus, Contra Costa County hopes to mitigate its own contribution to climate change by identifying and analyzing opportunities to reduce the GHG emissions generated by its municipal buildings and operations.

1.1 Climate Change Policy and Local Government

California's *Assembly Bill No. 32: the Global Warming Solutions Act of 2006* (AB32) requires California to reduce its GHG emissions to 1990 levels by 2020. Meeting this target will require that the state government inventory California's GHG emissions and identify and implement measures to reduce these emissions. Voluntarily and in anticipation of potential future regulation, many local governments are also monitoring their own GHG emissions and identifying opportunities for reduction.

1.2 Contra Costa County's Climate Protection Efforts

Contra Costa County's commitment to mitigating climate change began in May 2005, when the Board of Supervisors convened department heads in a Climate Change Working Group (CCWG) to identify existing County activities and policies that potentially reduced GHG emissions. The CCWG is comprised of the Agricultural Commissioner, the Deputy Director of Building Inspection, and the Directors of Conservation and Development, General Services, Health Services, and Public Works. In November 2005, the CCWG presented its Climate Protection Report to the Board of Supervisors, which included a list of existing and potential GHG reduction measures. To quantify Contra Costa County's current GHG emissions and to evaluate the impact of these GHG reduction measures, the Board of Supervisors approved a resolution in February 2007 to join ICLEI – Local Governments for Sustainability (formerly known as the International Council for Local Environmental Initiatives) and to conduct a GHG emissions inventory of Contra Costa County's countywide and municipal emissions. Upon completion of the inventory and associated report, the Board of Supervisors approved a resolution in October 2007 to complete a climate action plan for the County's municipal facilities and operations, funded by a grant from the Bay Area Air Quality Management District, which resulted in this report.

1.3 Promoting Community Actions

According to the County's GHG emissions inventory, emissions from County municipal operations represent less than one percent of total Contra Costa countywide emissions. Thus, mitigation of GHG emissions in Contra Costa County will require GHG reductions in both municipal operations and the greater community. However, while countywide GHG reduction measures may result in greater overall GHG reductions, the County government has greater control over its municipal emissions. Additionally, the County can take this opportunity to really lead by example and inspire changes in the greater community by first focusing on development and implementation of a Municipal Climate Action Plan consisting of reduction measures that target emissions generated by municipal operations.

2. 2006 Municipal GHG Emissions Inventory

The County completed its GHG emissions inventory in August of 2007 and revised this inventory in June of 2008. The results of the municipal inventory are illustrated below.

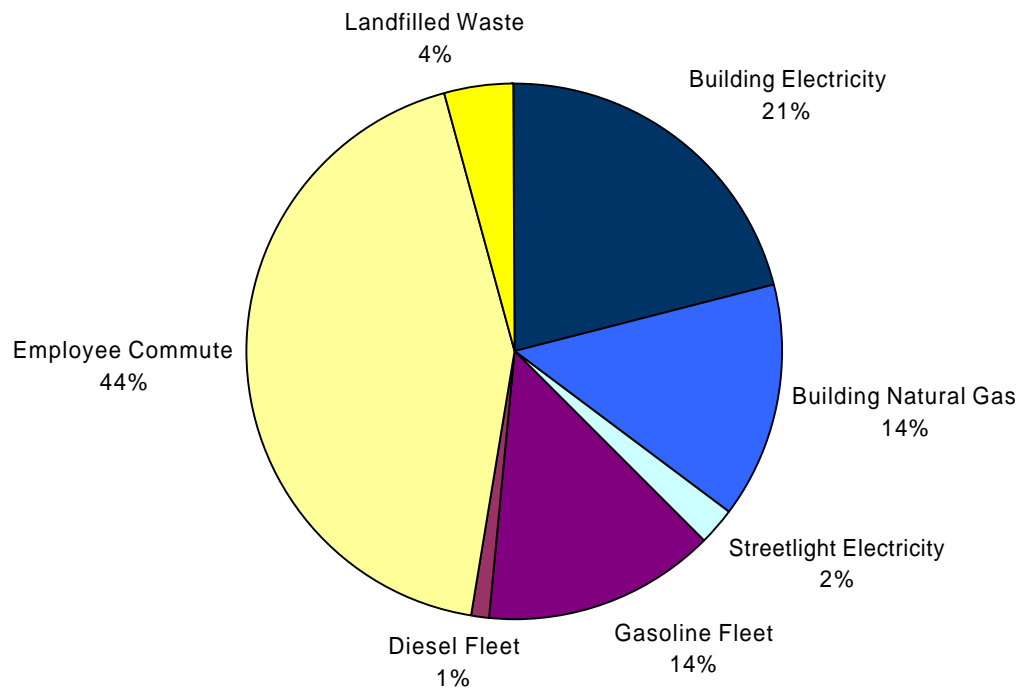


Figure 2.1 Municipal GHG emissions by source in 2006

Municipal GHG emissions in 2006 totaled 54,133 *metric tons of carbon dioxide equivalent* (MTCO₂e). MTCO₂e describes the amount of carbon dioxide that would have the same climate change impact as the actual variety of greenhouse gases. Employee commute was the largest source of municipal GHG emissions in 2006, followed by building electricity use, building natural gas consumption, fleet gasoline consumption, waste disposal, streetlight electricity use, and fleet diesel consumption. In addition to the sources represented in Figure 2.1, building propane and stationary diesel consumption, water and sewage electricity use, and fleet biodiesel and compressed natural gas (CNG) consumption represented less than one percent of total emissions. This inventory does not include GHG emissions generated by customers of County services, such as additional transportation emissions when customers visit County facilities.

To most effectively reduce its GHG emissions, the County could focus its efforts on its largest emissions sources. However, the County should aim to reduce emissions across all sources according to the following goals:

- Employee commute – reduce vehicle miles traveled by County employees
- County buildings – reduce energy consumption and utilize renewable energy
- County fleet – utilize cleaner fuels and fuel efficient vehicles
- Waste – reduce generation of waste and increase diversion
- Streetlights – reduce electricity use with energy efficient technologies

3. GHG Reduction Targets

Contra Costa County has joined over 30 counties in adopting the long-term GHG reduction target set by the US Cool Counties Climate Stabilization Declaration (see Appendix A). This declaration calls on the County to work with local, state, and federal governments and other local leaders to develop a regional plan to reduce *countywide* GHG emissions to 80% below baseline levels by 2050. The first step in inspiring these countywide reductions is to set interim targets that would bring the County closer to meeting this target for its *municipal* operations.

AB32 requires a *statewide* greenhouse gas reduction to 1990 levels by 2020. According to the proposed AB32 Scoping Plan, this is understood to be equivalent to a reduction of 15% below current levels by 2020. While there are currently no requirements for local governments, the County should anticipate potential future regulation and analyze its ability to meet this target for its *municipal* operations, in order to set an example for the county and the state. Data in this report (which will be presented in Section 5) shows that the County has exceeded this target for its municipal operations through programs that have already been planned or implemented.

The California Air Resources Board (ARB), in its proposed AB32 Scoping Plan, recommends the establishment of reduction targets for years 2020, 2030, and 2050. As the County has exceeded AB32's 2020 target for its municipal operations, and the 2050 target is far in the future, the County should establish an interim target for year 2030. A reduction target of **50% below baseline levels by 2030** for County municipal operations would keep the County on track toward the long-term target of 80% by 2050.

4. Meeting the Targets

Contra Costa County can achieve these targets by evaluating its existing and planned GHG reduction measures as well as additional measures for implementation. As time progresses, the County may exhaust the most cost-effective measures, but opportunities will develop as technologies improve, mass transit systems expand, and growing demand for environmentally-friendly products lowers costs.

Contra Costa County has already implemented many measures that have reduced its municipal GHG emissions. This report will analyze the GHG reductions achieved by these measures as well as those that could be achieved with the implementation of additional measures. The GHG reductions from these measures are analyzed below, and the measures themselves will be explained in detail in Sections 5 and 6. In accordance with the GHG inventory, GHG reductions are also measured in MTCO₂e, or metric tons of carbon dioxide equivalent.

For the purposes of this report, *existing measures* are those that were implemented prior to the 2006 inventory. *Planned measures* are those that will be implemented in the near future without further consideration. *Potential measures* are additional measures that are suggested in this report to further reduce GHG emissions.

4.1 Baseline, Projection, and Target Emissions Levels

The first step in reducing emissions toward the target levels is to determine the County's baseline emissions level, or the emissions level before anything had been done to reduce

emissions. This baseline is used to determine business-as-usual (BAU) forecast projections and target emissions levels for the target years.

In some cases, the initial GHG inventory will represent the baseline emissions level. However, the County inventoried its emissions for year 2006, at which time many measures had *already* been planned or implemented with resulting emissions reductions. Thus, the County's 2006 inventory is much lower than its actual baseline, and using the 2006 inventory as the baseline would penalize the County for acting early.

In order to give the County credit for its past efforts, a year 2000 backcast level will be used as the baseline, because most of the County's existing GHG reduction efforts were implemented after year 2000. This backcast is derived by quantifying emissions growth between years 2000 and 2006 and emissions reductions from measures implemented or planned prior to the 2006 inventory. Emissions growth 2000-2006 is subtracted from the 2006 inventory level, and avoided emissions due to existing and planned measures are added back to generate the baseline (see below).

2006 inventoried emissions level = 54,133 MTCO₂e
Emissions growth 2000 to 2006 = 646 MTCO₂e
Reduction achieved from existing and planned measures = 18,619 MTCO₂e
2000 baseline emissions level = 72,106 MTCO₂e

This baseline is used to calculate BAU projections and target emissions levels. BAU projections account for future growth and are based on an average annual employment growth since year 2000 of 0.2% per year. Target emissions levels represent the levels needed in the target years and are measured as a percent reduction from the baseline emissions level (see below).

2020 BAU projected emissions = 75,046 MTCO₂e
2020 AB32 target emissions (15% reduction from baseline level) = 61,290 MTCO₂e
Total reduction needed by 2020 = 13,756 MTCO₂e

2030 BAU projected emissions = 76,560 MTCO₂e
2030 proposed target emissions (50% reduction from baseline level) = 36,053 MTCO₂e
Total reduction needed by 2030 = 40,507 MTCO₂e

4.2 Target Analysis

The next step is to analyze the ability of reduction measures to meet these targets. These reduction measures will be explained in detail in Sections 5 and 6.

Reduction achieved from existing and planned measures = 18,619 MTCO₂e = 26%

Additional reduction needed by 2020 = 0 (target achieved and exceeded)
Additional reduction needed by 2030 = 21,888 MTCO₂e

Total possible reduction from potential measures = 26,919 MTCO₂e = 37%
Total reduction from existing, planned, and potential measures = 45,538 MTCO₂e = 63%

The potential reductions from the measures proposed in this report would allow the County to meet and surpass the proposed target of 50% by 2030 and would bring the County even closer to its long-term goal of 80% by 2050.

Figure 4.1 illustrates past and future paths for municipal emissions, including BAU projections based on average employment growth, existing and possible reductions from implementation of the existing, planned, and potential reduction measures, and the additional reductions needed to meet the 2020 target required statewide by AB32 and the proposed 2030 target.

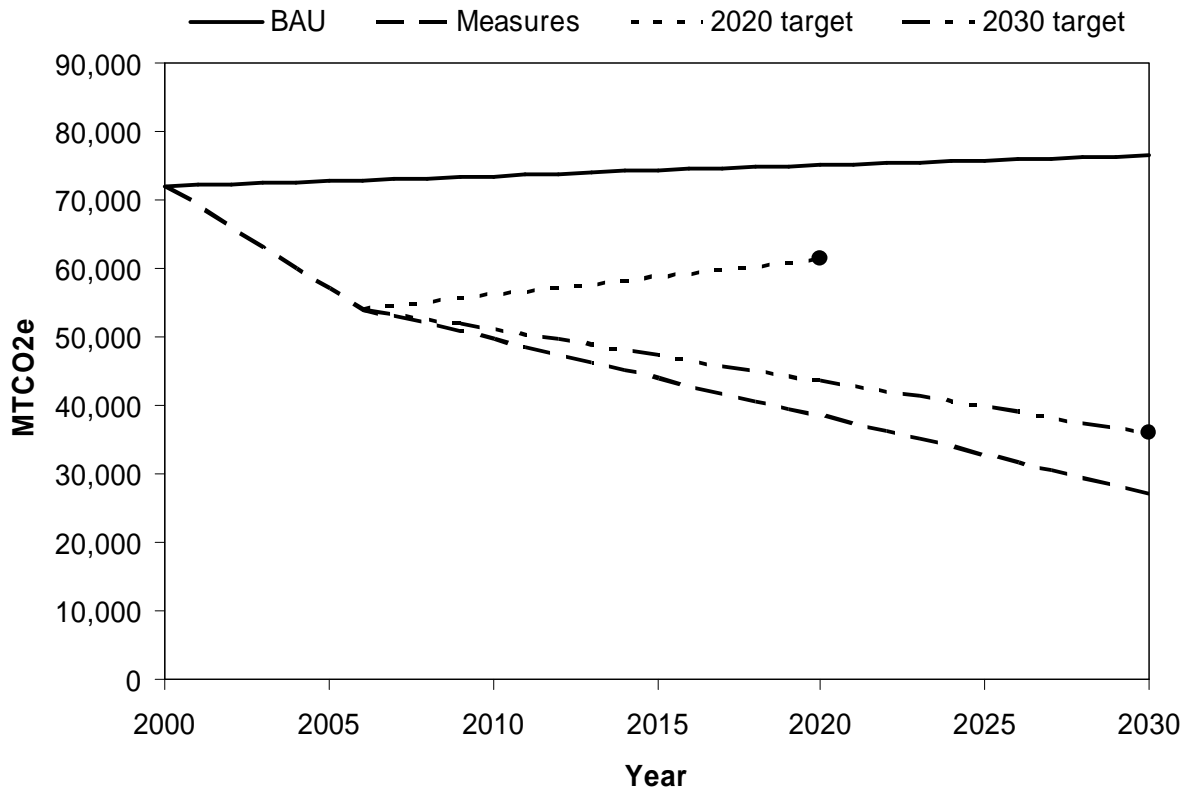


Figure 4.1 Municipal GHG emissions through 2030

Figure 4.1 illustrates that existing and planned measures have already exceeded the statewide target required by AB32, and that the potential measures identified in this report can exceed the proposed target of 50% by 2030 to achieve a total reduction of 63% below baseline levels. Further reductions to meet the long-term target of 80% by 2050 can be achieved with the identification of additional measures that will become more feasible with new technology and funding opportunities.

As the 2030 target is over 20 years away, the County can stay on track by striving for the following **milestones** along the path toward the 2030 target:

- 26% reduction already achieved with existing and planned measures
- 29% by 2010 – an additional reduction of about 3,000 MTCO2e
- 34% by 2015 – an additional reduction of about 3,800 MTCO2e
- 40% by 2020 – an additional reduction of about 3,800 MTCO2e
- 45% by 2025 – an additional reduction of about 3,800 MTCO2e
- 50% by 2030 – an additional reduction of about 3,800 MTCO2e

By following these milestones, the County can meet the proposed 2030 target with reductions of only 3,800 MTCO2e every 5 years.

5. Existing and Planned GHG Reduction Measures

Many of the following measures were originally identified in the November 2005 Climate Protection Report and were updated by the CCWG staff designees for this report. Appendix B lists existing and planned measures and their associated annual GHG reductions, where activity data (such as kilowatt hours of electricity reduced) was available or could be extrapolated. Appendix B also includes a detailed description of the calculations and assumptions used to extrapolate activity data. The annual GHG reductions associated with these reductions in activity data were modeled using ICLEI's Clean Air and Climate Protection (CACP) software.

This analysis has demonstrated that Contra Costa County's existing and planned municipal GHG reduction measures result in an annual reduction of 18,600 MTCO₂e, about 26% below a business-as-usual scenario. Of this reduction, 23% has already been achieved through existing measures, while the remaining 3% will result from planned measures.

This means that the County has exceeded the statewide target required by AB32 (equivalent to a 15% reduction) for its municipal operations through existing and planned measures. While this is a significant accomplishment and puts the County well on its way to achieving the additional reduction targets, many of these existing and planned measures can be feasibly expanded to further reduce emissions, such as increasing employee participation in commute programs, purchasing additional clean fleet vehicles, or expanding energy efficiency efforts to additional buildings.

Analysis of existing measures also provides an opportunity to investigate the relative success of different reduction measures. *Of the total reduction, 60% results from measures that target employee commute, 25% from building energy use, 9% from environmentally preferable purchasing, 3% from vehicle fleet, and 3% from waste reduction and recycling.* Commute measures showed the single greatest impact, and the County has a great opportunity to expand its commute programs because actual employee participation is much lower than expressed willingness in the County's commute survey.

Additionally, the County found particular success in reducing its municipal emissions from the following measures (as described by County staff), listed in order of greatest reduction:

Employee carpool and vanpool programs (9,668 MTCO₂e or 52% of the total reduction from existing and planned measures) – The County's support for employee carpools and vanpools was initiated in response to the energy crises of the 1970's and expanded to help reduce traffic congestion in the 1980's. The County currently offers a subsidy to County employees who participate in the Enterprise Rideshare Program. Employees who lease a vehicle from Enterprise Rideshare for carpooling or vanpooling are eligible for a 25-percent subsidy of the monthly lease payments, up to a maximum of \$75 per employee. This subsidy is funded by proceeds from the sale of the County's vanpool fleet which occurred in 2005. The County also provides preferential parking for employees that carpool to the downtown Martinez offices. Participating employees must apply for a parking permit from the Community Development Division to be eligible to use 30 parking stalls in the lot located on Pine Street between Marina Vista and Escobar Street in Martinez.

Direct digital control for HVAC systems in 33 buildings (1,620 MTCO₂e or 9%) – Direct digital control (DDC) on HVAC systems provides precise control over heating and cooling

systems, which optimizes operation and reduces simultaneous heating and cooling while maintaining comfort. Initially, DDC was targeted in the largest County buildings. DDC is now a County building standard and is installed in all new, remodeled, or improved buildings.

Flexible employee work schedules (1,412 MTCO₂e or 8%) – In 1991, the Board of Supervisors authorized all County Departments to implement flexible work schedules, including compressed work weeks, flextime, and staggered work schedules. It is up to each Department to determine how to implement these schedules, as long as public service is not compromised. GHG emissions are reduced when employees work more hours per day but fewer days per week, thereby eliminating commute trips.

Purchase of energy efficient computers (1,252 MTCO₂e or 7%) – The selection of Dell computers was achieved through an evaluation process in 2008. Cost reduction was the main motivating factor, as energy efficiency promotes cost savings to the General Services Department. The County preferred a manufacturer that sold Energy Star compliant products, as these standards are overseen by the Environmental Protection Agency.

Cogeneration plants for 4 buildings that operate 24 hours per day (735 MTCO₂e or 4%) – Cogeneration is on-site power generation that also utilizes waste heat to reduce energy required for heating and hot water systems. These systems are most economical in facilities that operate 24 hours per day and have year-round heat and hot water needs for laundry, kitchen, and bathing. These systems were installed using a combination of funding sources, including low-interest loans from the California Energy Commission, lease purchases, and County Energy Settlement funds from a 2000-2001 statewide lawsuit against energy companies.

Contra Costa County has also met with a third party that will implement the installation of cogeneration units at the Regional Medical Center and Juvenile Hall. There will be no upfront funding by the County for these projects, and the third party will handle permitting, contracting, procurement, and construction management for the projects. The annual utility savings will exceed the annual debt service payments resulting in a net annual savings.

LED traffic signals (558 MTCO₂e or 3%) – LED traffic lights are 85-percent more efficient than those with incandescent lamps. Ten and 25-watt LEDs replace 69 and 150-watt incandescent lamps and last five times longer, thereby reducing replacement costs as well as maintenance labor. This project was implemented as a maintenance project funded through the maintenance program.

Paper recycling program (520 MTCO₂e or 3%) – The County's paper recycling program was initiated in 1981 in the County's Administration Building and currently operates in about 200 County facilities. The program was developed in an effort to reduce waste sent to the County's landfills, thereby reducing the County's impact on natural resources and also generating revenue. The County's Department of Conservation and Development was tasked with publicizing and support of the program, while the General Services Department is responsible for collection of office recycling containers and consolidation in the main container for pick-up by private hauler. The early program was designed for white paper only, but the current program accepts a wider range of paper types and sorts by grade to maximize return.

Purchase of energy efficient copiers (491 MTCO₂e or 3%) – The process leading to the selection of the copiers was similar to that of the computers, but the copier decision was made earlier.

HVAC re-commissioning in 15 buildings (479 MTCO₂e or 3%) – Re-commissioning tests system operation and calibrates control sensors to ensure that the systems are operating as efficiently as possible. This measure was part of an overall state-funded program which offers “Public Goods” funds (generated by a small fee on utility bills) to implement re-commission projects to reduce energy use, so there was no cost to the County.

Installation of thermally resistant window films on select buildings (300 MTCO₂e or 2%) – Thermally resistant window films reduce heat gain and balance HVAC, thereby reducing energy use and increasing comfort for occupants. This program is more effective for existing buildings that do not have other built-in mechanisms for efficiency. Film specifications have been accepted and will be funded through maintenance at the request of building occupants.

Lighting improvement projects in 21 buildings (298 MTCO₂e or 2%) – The County commissioned a lighting consultant to develop lighting improvement strategies that apply to over 95-percent of County-owned lighting systems. Improvements were initially done at the 21 largest County buildings, implementing the latest in fluorescent lighting technologies. Projects were funded with internal funds, rebates, incentives, and various financing vehicles.

Change to B20 biodiesel fuel for diesel fleet (247 MTCO₂e or 1%) – The County implemented the change to B20 biodiesel in September 2006. The change was motivated by a desire to pursue clean air and environmentally responsible fleet operations. The use of B20 displaces petroleum fuel consumption by 20-percent versus standard diesel. In 2007/2008, the General Services Department dispensed approximately 80,000 gallons of B20 biodiesel, displacing consumption of 16,000 gallons of diesel fuel. The change to B20 biodiesel was accomplished by drawing down the existing diesel in the underground storage tank, washing and evacuating any remaining residue, and refilling the tank with B20 biodiesel. All filters were changed at this time, and filter changes for fuel dispensing equipment and diesel vehicles were changed twice as frequently for six months to eliminate any possible fuel delivery issues.

Purchase of 86 hybrid vehicles for fleet (206 MTCO₂e or 1%) – The purchase of the 86 hybrid vehicles currently in use with the County fleet has taken place over the past eight years and was intended to reduce County vehicle emissions and fuel expenditures. Vehicle use applications that are compatible with the capabilities of hybrid vehicles were identified, and hybrids were assigned as appropriate. The hybrid vehicles were purchased incrementally as equipment was replaced and also as additional vehicle requests where new vehicles were added to the fleet. With fuel prices at record highs, fuel savings now rapidly offset the additional procurement costs very early in the equipment lifecycle. The hybrid vehicles in use (Toyota Prius, Honda Civic, and Ford Escape) were selected based upon superior fuel economy and minimal tailpipe emissions. The selected hybrids were then placed on County procurement contracts following development of specifications and passage through the County’s bid process. As of Summer 2008, the County has operated hybrid vehicles over 3,700,000 miles while saving an estimated 95,000 gallons of fuel.

Currently, the County’s Fleet Department strives to purchase clean vehicles in all possible vehicle replacements. The County’s fleet was recently recognized as the #5 Best Green Government Fleet in North America by the 100 Best Fleets organization.

The measures listed above represent 98% of the total reduction achieved from existing and planned measures. The additional measures that represent the remaining 2% of the total reduction are listed in Appendix B, which includes a full list of measures.

6. Potential GHG Reduction Measures

To further reduce emissions toward the recommended reduction targets, the County can expand upon existing measures and identify additional measures for implementation.

Many of the potential measures included below were initially identified in the November 2005 Climate Protection Report and were originally selected by looking to climate action plans from other local governments and selecting measures that fit Contra Costa County conditions. The subset of these measures that is highlighted in this report represent those measures that were identified by County staff to be the most operationally feasible and expected to have the greatest GHG reductions based on information available. Additional measures were identified based on further examination of climate action plans from other local governments.

GHG reductions were modeled using the CACP software, and anticipated implementation costs and processes were provided by County staff and consultants. GHG reductions and costs were derived when direct data was not available. See Appendix B for a detailed description of the calculations and assumptions used to derive GHG reductions and costs, including general metrics that can be used by other local governments.

It should be noted that this analysis does not consider qualitative criteria, such as educational value or ability to generate awareness. Additionally, this report does not analyze lifecycle emissions in the evaluation of measures—as this would be inconsistent with the inventory and CACP software—but lifecycle analysis may be an important factor in prioritization for implementation.

The following symbols are used to compare the GHG reduction potentials of the measures:



- Potential reduction less than or equal to 100 MTCO₂e



- Potential reduction between 101 and 500 MTCO₂e



- Potential reduction between 501 and 1,000 MTCO₂e


















- Potential reduction between 1,001 and 5,000 MTCO₂e



- Potential reduction greater than 5,000 MTCO₂e

Table 6.1 presents evaluation criteria for the potential measures, including GHG reduction potential, implementation cost, and payback period in years.

Table 6.1 Evaluation criteria for potential measures

	Measure # and name	MTCO2e reduction	Rating	Imp. Cost	Payback (years)	Add'l. \$ needed
Energy	1 HVAC re-commissioning	1,475		\$500,000	1	
	2 Lighting improvement	207		\$300,000	5	X
	3 Energy awareness	951		Low	-	
	4 LED streetlights	704		Unknown	-	X
	5 Solar PPA	212		None	-	
	6 Window films	410		\$800,000	3-5	
Fleet	7 Hybrid fleet	240		\$300,000	4-5, resale	
	8 CNG fleet	64		\$400,000	3-12, resale	
	9 E85 tank	490+		\$100,000	-	X
Commute	10 Parking fee	9,553		Revenue	-	X
	11 Pre-tax transit	6,687		\$50,000	-	X
	12 Compressed weeks	1,203		Low	-	
	13 Telecommuting	4,619		Low	-	
Waste	14 Duplex printing	87		None	-	
	15 Compost	17		\$35,000	2 years	X

The total GHG reduction potential of these measures is about 27,000 MTCO2e or 37% of baseline levels. The total cost to the County for implementing these measures would be about \$3 million, not accounting for the revenue that could be generated by implementing a user fee for parking.

The last column indicates whether the measures would definitely require funding beyond existing departmental and maintenance budgets. The measures that are marked in this column should *not* be expected to be funded within existing budgets, and additional funding will be required. However, funding opportunities are available for most measures and are described in the following sections.

The following sections provide elaboration of the information in Table 6.1.

6.1 Energy Efficiency and Renewable Energy

1. Expand HVAC re-commissioning program to 50 additional County buildings.



Annual GHG Reduction: 1,475 MTCO₂e

Implementation Cost: \$500,000

Payback Period: 1 year

Implementation Scenario: This program has been successfully implemented in 15 buildings, and all buildings with HVAC controls can benefit significantly from re-commissioning. This program yields excellent returns per investment. Minor upgrades and re-commissioning of systems has yielded on average \$0.18 per square foot in savings on an investment of about \$0.185 per square foot, yielding a payback of less than 1 year.

This program can be included in the annual Facilities Maintenance budget or funded through state programs. The state channels “Public Goods” funds (generated by a small fee on utility bills) to utilities to administer numerous third parties (such as the California Energy Commission, Quantum Consulting, Cogent Energy, and the Association of Bay Area Governments’ Energy Watch program) to provide their own incentives to reduce energy use. The third party can pay a commissioning agent (typically a mechanical engineering or energy engineering company) to calibrate instrumentation and modify operations in County buildings at no cost to the County.

2. Expand lighting improvement program to 30 additional County buildings.



Annual GHG Reduction: 207 MTCO₂e

Implementation Cost: \$300,000

Payback Period: 5 years

Implementation Scenario: The County has an existing procurement process for lighting retrofit projects. Lighting retrofits cost \$0.30 to \$0.50 per square foot.

There are also excellent rebate programs to offset some initial costs. The State of California has funded electric utilities through the “Public Goods” charge on utility bills for a host of energy efficiency and renewable energy programs. Extensive lighting rebates are available from most electric companies to replace older technologies, where the rebate amount depends on the specific products being replaced (all available rebates are listed on PG&E’s website). The California Energy Commission also offers low-interest loans to public entities for energy efficiency through its Energy Efficiency Financing Program, which could help fund implementation costs. Additionally, Energy Service Companies (ESCOs) can fund the upfront

implementation costs of lighting projects as part of a wider energy efficiency effort at the site and then share future cost savings with the County.

3. Create an employee energy awareness program to promote energy conservation and efficient use of County facilities.



Annual GHG Reduction: 951 MTCO₂e

Implementation Cost: Low cost, and usually offset by energy savings

Implementation Scenario: As part of its Federal Energy Management Program, the US Department of Energy offers a handbook on the design and implementation of a facility energy awareness program—including instructions on creation of staff surveys, formation of focus groups, identification of desired behaviors, identification of motivations, and development of messaging. It provides examples of desired behaviors, communication channels, and specific messaging strategies. This measure requires only a small cost for staff labor, materials, and administrative costs.

This handbook is available at http://www1.eere.energy.gov/femp/pdfs/step2_hndbk.pdf.

4. Install LEDs in all county-owned streetlights (if pilot studies are successful).



Annual GHG Reduction: 704 MTCO₂e

Implementation Cost: Unknown as still in preliminary test phase

Implementation Scenario: The Environmentally Preferable Purchasing Policy recently adopted by the County's Board of Supervisors includes a direction to replace street lighting with energy-efficient equipment. This measure should be implemented upon successful completion of pilot studies. LEDs for street lighting are still in the early adopter phase and refinement in product offerings are still forthcoming. This project will be implemented by the Public Works Department. LEDs streetlights will initially be expensive to implement but, depending on success of the technology, utility-wide or state-wide loan and rebate programs may be created to assist in the funding and conversion of the streetlight system to this new technology. If this technology proves to be successful, the County will also have to determine responsibility of the system between the County and the utility, and consider the creation of new lower streetlight tariffs to reflect the reduced energy use of LEDs.

The city of Ann Arbor, Michigan is replacing over 1,000 streetlights in its downtown area with LEDs. The city estimates that this project will take two years to complete and cost about \$600,000 to implement. The LEDs will save about \$100,000 a year in energy savings and will significantly decrease maintenance and replacement costs. Ann Arbor has committed to eventually replacing all city streetlights with LEDs (Gantert 2007).

5. Install additional solar systems at the West County Detention Facility, the Buchanan Airport Field, the Pleasant Hill Library, and the Elections Office.



Annual GHG Reduction: 212 MTCO₂e

Implementation Cost: No up-front cost

Payback Period: Immediate with PPA

Implementation Scenario: The appropriate installed capacity of these potential systems would be 300 kW for the West County Detention Facility and the Buchanan Airport Field, 100 kW for the Pleasant Hill Library, and 85 kW for the Elections Office. Solar power generated at the Buchanan Airport could be delivered to adjacent facilities on County-owned land.

Solar installations are expensive with paybacks in the 15-year time frame even when including incentives. Rebates from the “California Solar Initiative” are offered in varying amounts that are dependent on the expected performance of the system. More information is available on the Go Solar California website. This measure can also be funded by a Power Purchase Agreement (PPA) with no upfront cost to the County. A PPA is a lease from a private company that installs and owns the system, and there are many companies currently offering PPAs. The County pays for electricity generated by the system to a leaser and, after the lease term, the County acquires ownership of the system.

6. Install thermally resistant window films on 30 additional existing County facilities.



Annual GHG Reduction: 410 MTCO₂e

Implementation Cost: \$800,000

Payback Period: 3 to 5 years

Implementation Scenario: Reducing heat gain at perimeters balances HVAC, reduces energy use, and increases comfort to occupants. This program is more effective in existing buildings that do not have other built-in mechanisms for energy efficiency. Facilities will install film upon request by building inhabitants, but the County should also install window film as a general program at appropriate sites.

This measure can be included in maintenance and building budgets as film specifications have been accepted.

6.2 Vehicle Fleet

7. Purchase 100 more hybrid vehicles for the fleet.



Annual GHG Reduction: 240 MTCO₂e

(Additional) Implementation Cost: \$300,000

Payback period: 4 to 5 years; time of resale

Implementation Scenario: At the current replacement rate of 25 hybrid vehicle purchases per year, the County will achieve this goal in 4 years. Each hybrid sedan adds approximately \$3,000 over the cost of a standard non-hybrid vehicle. Since the vehicles are being procured to replace older retired vehicles, the additional cost to add hybrids to the fleet may be estimated at \$3,000 per vehicle. However, the hybrid resale values are approximately \$3,000 higher than a comparable sedan, thereby offsetting the additional procurement expense at the time the vehicle is sold. The higher fuel economy also results in about \$700 in fuel savings for every 10,000 miles driven with gasoline estimated at \$3.60 per gallon. Thus, it will take 43,000 miles of operation to offset the additional procurement cost, which yields a payback period of about 4 years at the average annual mileage of 10,000 miles. Each hybrid SUV adds about \$6,000 over the cost of a comparable non-hybrid SUV. The higher fuel economy of the hybrid results in about \$900 in fuel savings for every 10,000 miles of operation with gasoline estimated at \$3.60 per gallon. Thus, it will take 67,000 miles of operation to offset the additional procurement cost, which yields a payback period of about 5 years at the average annual mileage of 14,000 miles.

This measure could be funded through the Bay Area Air Quality Management District (BAAQMD) Transportation Fund for Clean Air (TFCA) County Program Manager Fund. These grants are funded by a \$4 surcharge on vehicles registered in the Bay Area and are available to public agencies within the BAAQMD's jurisdiction. More information is available on the BAAQMD's website. There is also the possibility of funding through the California Energy Commission to be made available next year under 2007 California Assembly Bill 118 (AB118). Additionally, funding that is reserved in an Internal Service Fund for vehicle replacements can cover the purchase of hybrid vehicles at the current replacement rate.

8. Purchase 50 more CNG vehicles for the fleet.



Annual GHG Reduction: 64 MTCO₂e

(Additional) Implementation Cost: \$400,000

Payback period: 3 to 12 years; time of resale

Implementation Scenario: This program would likely include 30 dedicated CNG sedans and 20 dedicated CNG vans. Purchase of CNG sedans add about \$3,000 over a non-hybrid sedan.

CNG vehicle resale values are currently very high due to low CNG prices, various incentive programs, and tax credit programs. Increased resale values may continue to at least partially offset the majority of the additional procurement cost upon resale. Additionally, CNG fuel is cheaper than gasoline per gallon equivalent and the CNG sedan has better fuel efficiency than a standard gasoline sedan. This reflects a substantial operational savings of about \$900 for every 10,000 miles of operation (with CNG estimated at \$2.00 per gallon and gasoline estimated at \$3.60 per gallon). Thus, it will take 33,500 miles of operation to offset additional procurement cost, which yields a payback period of about 3 years at the average annual mileage of 10,000 miles. CNG vans add \$17,500 over the purchase of a standard gasoline van and save approximately \$1,000 in fuel costs for every 10,000 miles driven. Thus, it will take 175,000 miles of operation to offset additional procurement cost, which yields a payback period of about 12 years at the average annual mileage of 14,000 miles.

This measure could be funded through the BAAQMD TFCA County Program Manager Fund. These grants are funded by a \$4 surcharge on vehicles registered in the Bay Area and are available to public agencies within the BAAQMD's jurisdiction. More information is available on the BAAQMD's website. If the California Air Resources Board (ARB) Alternative Fuel Vehicle Incentive Program (AFVIP) receives additional or transferred funding, CNG Civic sedans may be eligible for additional incentives under this program. More information can be found on the ARB's website. There is also the possibility of funding through the California Energy Commission to be made available next year under AB118. Additionally, funding that is reserved in an Internal Service Fund for vehicle replacements can cover the purchase of CNG vehicles at the current replacement rate.

9. Install an above-ground 5,000-gallon E85 ethanol fuel tank for the County's 70 FlexFuel vehicles as well as other users (CHP and CALTRANS).



Annual GHG Reduction: 490 MTCO₂e *and growing* (with additional FlexFuel cars)

Implementation Cost: Up to \$100,000

Implementation Scenario: The tank and dispenser equipment have been quoted at \$45,000, but the actual cost of the complete project is dependent upon several factors—such as permitting, site improvements, and environmental impacts—that will not be finalized until a formal proposal is complete. It is estimated that the County will have close to 70 E85 capable Flex Fuel Vehicles (FFV) in service by the end of 2008. Local government fleets such as CALTRANS and a California Highway Patrol station have indicated an interest in fueling with E85 if the County implements this proposal.

Installation of alternate fuel infrastructure projects may be suitable for BAAQMD TFCA County Manager Funds. Additionally, the ARB has made alternate fuel infrastructure funding available through the Sacramento Metropolitan Air Quality Management District (SMAQMD) for Northern California locations outside the originally proposed Sacramento area, but current grants are limited in funding and deadlines. There is also the possibility of funding through the California Energy Commission to be made available next year under AB118.

Additional Considerations

While E85 ethanol fuel reduces GHG emissions from vehicle fuel consumption, scientists warn that the production of ethanol fuel could actually increase lifecycle GHG emissions and could otherwise harm the environment and the world population. Growing production of ethanol fuel from corn crops could increase GHG emissions from the corn industry and the transportation of crops from the corn-producing Midwest states, and could intensify world food crises resulting from the increased price of corn (Borenstein 2008). As a result, some scientists and politicians are encouraging the use of other energy-intensive, non-corn crops for the production of ethanol fuel, but many of the suggested crops are invasive species that could threaten native plants and crops (Rosenthal 2008). Thus, the County should consider awaiting the selection of a truly environmentally-friendly crop before expanding its use of ethanol fuel.

In addition to the measures listed above, the County should investigate an opportunity to utilize alternative fuels through **Kroll Green Leasing (KGL)**, which operates a new “Lease to Own” program for electric vehicles. This program is currently targeting businesses and individuals, but opportunities for local government are anticipated in the future. More information can be found at www.krollgreenleasing.com. The impact of this program could intensify in the future if the County powered its electric vehicles with electricity generated from clean sources.

6.3 Employee Commute

10. Institute a user fee for parking spaces owned or leased by the County and allocate the surplus revenue to incentives for use of commute alternatives.



Annual GHG Reduction: 9,553 MTCO₂e

Implementation Cost: \$800,000

Annual Operating Cost: \$300,000

Annual Revenue: \$2 million

Implementation Scenario: Currently, the County owns or leases thousands of off-street parking spaces and provides this parking free to County employees and visitors. The 2007 Employee Commute Survey shows that only 10-percent of County employees that drive to work cite parking costs as one of the top three cost elements for their commute. Parking costs become more of a factor for employees working in downtown Martinez, where the County does not offer sufficient parking and employees must pay for metered spaces on-street or in City parking lots. Consequently, the 2007 Employee Commute Survey found that 29-percent of employees in downtown Martinez cited parking costs as one of the top three cost elements for driving to work, which may contribute to the lower drive-alone rate for downtown work sites. This suggests that additional parking fees could further reduce the drive-alone rate for County employees.

Based on the 2007 Employee Commute Survey, about 50-percent of all County employees work in Martinez, so Martinez facilities were evaluated for initiation of a user fee for off-street parking. It is assumed that parking for small and isolated facilities would not be included in the user fee program. Based on a review of the inventory of County facilities in Martinez, user fees for parking could be applied to 29 County buildings, affecting 3,388 unrestricted off-street parking spaces and 4,770 employees.

County staff considers multi-space parking stations as a cost-effective method to collect user fees for off-street parking spaces. These pay stations are currently being used in downtown Walnut Creek for on-street parking. To collect parking charges, the County would number each parking stall and have employees record their parking stall at the pay station and pay the required fee for the specified length of time. This is similar to the system BART uses for collecting parking charges at BART stations. The pay stations can differentiate between spaces dedicated for short term visitor parking and spaces dedicated for long-term employee parking. The pay station can transmit to enforcement personnel, via a wireless handheld device, a diagram of the parking facility that highlights unpaid parking stalls. Enforcement personnel can inspect these stalls and ticket cars that occupy these spaces. Pay stations are solar-powered and require no power hook-up. Vendors can provide support ranging from technical support to full program administration. It may be possible to establish prepaid accounts for employees that pay stations could recognize through employee identification numbers. A minimum of two pay stations should be located close to each County building to ensure at least one is working at all times, and a ratio of one pay station per 50 parking spaces would avoid excessive queuing as employees arrive to the workplace.

Currently, the County's cost to provide off-street parking is charged to each County department on a fair share basis and paid through each department's budget. The annual cost for the user fee program could be addressed in two ways. The cost for the user fee program could similarly be charged to each County department on a fair share basis and paid through each department's budget. This would allow all revenue generated by the user fee to be allocated to encourage the use of commute alternatives. Alternatively, the cost of the user fee program could be paid by the revenue generated by the pay stations. With this approach and based on the "market rate" for parking in Martinez, the program would still provide a \$1.5 million annual surplus that could be used to encourage the use of commute alternatives. All surplus funding should be directed toward commute alternatives and not redirected to support other activities.

The 2007 Employee Commute Survey suggests that factors like convenience are more important to commuters than factors like commuting costs. Thus, revenue could be used to increase the convenience of commute alternatives, such as funding more convenient bus service to County buildings. Martinez is located in the County Connection bus service area. County Connection budgets \$28 million annually to operate bus routes in its service area, and some of this revenue comes from developers and cities that contract with County Connection to provide enhanced bus service. The estimated revenue the County would receive from user fees on parking in Martinez would range from \$1.5 million to \$2 million annually, which represents between 5 and 7-percent of County Connection's budget.

Additionally, a guaranteed ride home for emergencies was identified by 47-percent of solo commuters as a significant factor that would encourage use of commute alternatives. This service is currently offered by 511 Contra Costa to all employers in the county, free of charge.

The financial impact on employees could be reduced if the County allowed employees to pay this user fee with pretax dollars using the same tax code provision that is currently used for the Health Care Spending Accounts offered to County employees.

The County should initiate a broad education campaign informing affected employees of commute alternatives prior to the institution of parking charges. The Human Resources Department should be included in the planning for distribution of materials related to commute alternatives and parking options to all existing employees and new hires.

While significantly reducing GHG emissions, imposing parking charges at this scale would be a complex undertaking—requiring cooperation and consultation with all County departments, employee unions, the City of Martinez, County Connection, and neighboring properties.

11. Allow County employees to use pre-tax dollars to pay for mass transit or carpool expenses.



Annual GHG Reduction: 6,687 MTCO₂e

Implementation Cost: \$50,000

Implementation Scenario: The concept of allowing employees to use pre-tax dollars to pay for commute expenses is similar to the Health Care Spending Accounts currently offered by the County to employees. The program is currently administered by the Human Resources Department, although they are considering hiring a contractor to administer the program. Employers who provide the benefit for commute expenses call these programs Commuter Spending Accounts (CSAs). CSAs take advantage of tax savings available through Section 125 of the Internal Revenue code, which is the same provision enabling the establishment of our Health Care Spending Account benefit. The money an employee allocates to the CSA is not subject to federal, state, or Social Security or Medicare (FICA) taxes. Eligible expenses include costs for transit fare, vanpool fees, and parking charges. If the County pursues a user fee for County parking facilities, CSAs could be an important component to streamline the collection of fees from County employees that use these parking facilities and to minimize parking costs for employees that drive to work.

12. Institute compressed work weeks in all County departments.



Annual GHG Reduction: 1,203 MTCO₂e

Implementation Cost: Low Cost

Implementation Scenario: Board policy authorizes implementation of compressed work weeks in all County departments. Currently, compressed work weeks are *not* offered to about 30-percent of the workforce, likely due to the policies of individual Departments or the demands of certain County services. The County should identify the barrier to increased use of compressed

work weeks through discussions with staff. If the barrier is at the manager level, the County should consider sponsoring training for these managers to address their concerns about compressed work weeks. The County should also send a message to all staff to make sure that employees are aware of opportunities to utilize compressed work schedules.

13. Expand the telecommuting program by identifying opportunities to increase employee participation to 30%.



Annual GHG Reduction: 4,619 MTCO₂e

Implementation Cost: Low Cost

Implementation Scenario: Board policy authorizes implementation of telecommuting in all County departments. According to the Employee Commute Surveys, actual employee participation is much lower than expressed willingness to telecommute. The extent of telecommuting is dependent on the policies of individual departments or managers. The County's telecommute procedures provide guidance to managers who are considering this practice. The County should identify the barrier to increased telecommuting through discussions with staff. If the barrier is at the manager level, the County should consider sponsoring training for these managers to address their concerns about telecommuting. The County should also send a message to all staff to make sure that employees are aware of opportunities to utilize the telecommuting program. The GHG reduction above is based on a telecommuting rate of two days out of every week for participating employees.

6.4 Waste Reduction and Recycling

14. Set the default on all copying/printing machines to duplex (double-sided) mode for all print jobs and possibly copy jobs.



Annual GHG Reduction: 87 MTCO₂e

Implementation Cost: No implementation cost but could increase charges

Implementation Scenario: The County leases its copying and printing machines from Caltronics Business Systems. Caltronics will send technicians to change all copying and printing machines to default duplex at no additional cost, as maintenance fees are included in the lease. This default could be set upon installation for future machine purchases.

However, duplex defaults could generate an additional cost to the County on single-page copy and print jobs, as the machine will process (and charge for) the blank backside of the page. The County's Purchasing Manager estimates that about half of copy and print jobs are single-paged, so this could represent a significant cost to the County. When defaults are set to duplex, users can still switch their preference to single-sided printing for individual documents. Thus, to

resolve this problem, the County could send a notice or provide a training asking staff to manually change the settings to single-sided when copying or printing a single-page document.

To increase the impact of this measure, the County could also eliminate desktop printers, which are less likely to print duplex and cost more per print.

15. Divert organic waste from parks and landscaping to on-site compost.



Annual GHG Reduction: 17 MTCO₂e

Implementation Cost: \$35,000

Payback Period: 2 years

Implementation Scenario: After a thorough study of the County's waste practices, CalRecovery, Inc. estimates that the County's General Services Department produces about 170 tons of greenwaste from groundskeeping each year. CalRecovery concludes that this greenwaste could be composted using simple and inexpensive technology, specifically a turned-windrow composting process. This would require about 2,000 to 3,000 square feet of vacant land and a small chipper/grinder and small turner. At this scale of facility, even the smallest capacity processing equipment would still have processing capacity much greater than 170 tons per year. Thus, if the General Services Department has equipment that is not used full time, it could be dedicated to composting this small amount of greenwaste for one day each week. Alternatively, if new equipment must be purchased, it could also be used for other purposes. CalRecovery suggests that the County evaluate this project as a pilot study, and the additional capacity of this system leaves room for feasible expansion.

The capital costs associated with a 170 tons per year turned-windrow composting operation would be about \$35,000. This includes site preparation, a small chipper/grinder, and a small turner. CalRecovery concludes that the avoided disposal costs would offset the capital costs within approximately 1.5 to 2.5 years. Additionally, the capital costs would be considerably less if the County can borrow existing equipment for this measure.

6.5 Green Building and Environmentally Preferable Purchasing

Both environmentally preferable purchasing (EPP) and green building will be instrumental in reducing the County's municipal greenhouse gas emissions. However, the GHG inventory does not include a lifecycle analysis of GHG emissions from procurement activities, and future GHG projections cannot forecast emissions increases from the construction of additional buildings, so it would be inconsistent to include GHG reductions from EPP and new green building projects in calculations toward the reduction targets. (Reductions from the purchase of products with the potential to reduce energy use are included in the existing measures because energy use *is* included in the GHG inventory.) While these reductions will not be included in the calculations in this report, EPP and green building efforts have great potential to reduce GHG emissions and

tools are available to quantify GHG reductions and costs. Additionally, the County currently has many opportunities to implement EPP and green building policies for its municipal operations.

The County should develop green building standards for all new and remodeled municipal buildings, and can pilot these standards in the building that is currently being planned for the Department of Conservation and Development. The County Board of Supervisors has provided a strong foundation for implementation of a green building policy for municipal buildings. In August 2001, the Board of Supervisors approved a recommendation to consider lifecycle costing and other green building policies for County buildings. In April 2008, the Board of Supervisors adopted an EPP Policy that includes a direction to follow Leadership in Energy and Environmental Design (LEED) guidelines in County building and renovation projects, where appropriate. The County should move to implement these policies by setting a **standard of LEED Silver designation** for new municipal buildings, noting that there is a growing tendency to build to LEED standards but save the money that would be spent on LEED third-party certification for the actual construction of sustainable building features. Many US cities, including Los Angeles, have passed ordinances that require LEED building standards without requiring actual LEED certification (Wendt 2008).

Since 44% of the GHG emissions from our municipal operations are generated by transportation of building inhabitants to and from buildings, the County's lifecycle costing and green building policies for new facilities should be revised to address **building site locations**. Locating new County facilities within easy walking distance to transit and related uses (including supporting County offices and business, eating establishments, and personal services) can minimize the associated transportation emissions.

The County's EPP Policy also provides justification for future climate-friendly procurement activities as a separate initiative. Thus, this report will not individually list projects, but rather recommend **enthusiastic support and implementation of the EPP policy** and all relevant activities. The County's EPP Policy includes a broad package of policies and standards targeting the purchase of recycled-content and recyclable products, the purchase of energy efficient vehicles and equipment, the request that vendors minimize packaging, the use of sustainable landscaping techniques, and the elimination of toxics in procured products. Implementation of this policy has already begun with the initiation of the County's Recycled Paper Program effective July 15, 2008, which will substitute all paper orders with recycled-content paper.

The County approved this policy with an understanding that, as commercial markets and demand for "green" products has grown, the cost for these products has become more competitively priced and will continue to do so. Thus, it is critical to support local recycling markets to maintain and improve the feasibility of this policy.

7. Analysis of Potential Measures

Table 7.1 ranks the potential measures based on GHG reduction potential and implementation cost, in order to evaluate their effectiveness. These two ranks are added together to generate an overall rank that weighs both GHG reduction potential and implementation cost equally.

Table 7.1 Ranking of potential measures

	Measure # and name	Rank according to GHG reduction	Rank according to implementation cost	Sum of ranks	Overall rank
Energy	1 HVAC re-commissioning	4	13	17	8
	2 Lighting improvement	12	10	22	11
	3 Energy awareness	6	4	10	4
	4 LED streetlights	7	-	-	15
	5 Solar PPA	11	2	13	6
	6 Window films	9	14	23	13
Fleet	7 Hybrid fleet	10	10	20	10
	8 CNG fleet	14	12	26	14
	9 E85 tank	8	9	17	8
Commute	10 Parking fee	1	1	2	1
	11 Pre-tax transit	2	8	10	4
	12 Compressed weeks	5	4	9	3
	13 Telecommuting	3	4	7	2
Waste	14 Duplex printing	13	2	15	7
	15 Compost	15	7	22	11

Measure 10, to charge a user fee for parking, ranks number one in both GHG reduction potential *and* implementation cost, as it generates revenue that greatly exceeds costs (although it still requires seed money to implement). Measures 11, 12, and 13, the other commute measures, rank next as they have high GHG reduction potential and only a small cost for existing staff time. Thus, the County has a great opportunity to reduce its GHG emissions by targeting employee commute, but commute measures may also provide unique challenges as they involve individual behavior.

Measure 3, to create an employee energy awareness program, ranks next as it also has high GHG reduction potential and only a small cost for existing staff time. Measure 5, to enter into a PPA for solar systems, and Measure 14, to set copying/printing machines to default duplex, rank next as there is no upfront cost to the County for either project. Measure 9, to install an E85 ethanol fueling tank, ranks next as it has high GHG reduction potential. This measure also provides an opportunity to offset costs with purchases from other agencies, but it has controversial side effects. Measures 1, 2, and 6, the other energy measures, will pay themselves off within 5 years. Measure 15, to compost municipal landscaping debris, will also pay itself off within 2 years. Measures 7 and 8, the other fleet measures, have internal funding available and will offset their costs at the time of vehicle resale.

This analysis suggests that all the measures proposed in this report are feasible for implementation, with the possible exception of Measure 4, which requires additional research.

8. Maintaining Efforts

The MCAP is only the beginning of the County's climate protection process. The County's next steps include the implementation of the MCAP and the development of a *community-wide* climate action plan to include measures that would reduce countywide emissions.

The County should consider establishing an internal **staff workgroup** that would meet on a regular basis and report to the County's Climate Change Working Group. This workgroup could promote the implementation of the municipal measures in this report and identify additional measures, track progress in reducing municipal GHG emissions, identify necessary changes in policies to more effectively reduce emissions, and implement educational trainings, campaigns, and competitions for County staff.

A separate workgroup could focus on designing and implementing a **community-wide climate action plan**. The County should consider involving the local community in the development of this plan to strengthen its support and applicability, possibly looking to the City of Berkeley's process of including public workshops and online comment periods.

The County should also identify a formal structure for **collaboration with the local cities** on countywide climate protection efforts. Collaboration with cities could include the sharing of ideas and resources, partnership on grant applications, or a countywide outreach and education campaign. To achieve countywide collaboration, Marin County created the Marin Climate and Energy Partnership (MCEP), which is composed of one staff person from each jurisdiction and meets once a month. Marin County is also hiring a Climate Action Director to oversee project implementation, apply for funding for projects and staff, and report to the MCEP. The MCEP received grant funding to pay for the Climate Action Director and for ICLEI involvement, and each jurisdiction will contribute additional funds beyond these grants. Sonoma County took a different approach with its Climate Protection Campaign (CPC). The CPC structure is focused on a non-profit group that organizes public meetings, coordinates outreach efforts, and applies for funding. Jurisdictions initially contributed funds for this effort, and further funding will be provided by grants. The County's approach can build on these models, utilizing both internal capacity and opportunities for involvement of the public and the private sector.

The County should consider establishing a **revolving fund** for climate protection activities. As many GHG reduction projects will eventually lead to financial savings, these savings could be placed in a revolving fund to pay for implementation of measures or climate staff-time for further research and planning. The County could also consider creating a **climate protection charge** on the departments to fund these efforts.

Ultimately, a **dedicated staff person** would be necessary to provide the leadership needed to help the County meet its targeted goals in a strategic and comprehensive manner. This staff person would lead efforts to coordinate project implementation, work with appropriate staff to develop policies and design strategies and programs to reduce emissions, monitor progress toward the GHG reduction targets adopted by the Board of Supervisors, and track state and federal policy and its implications for local government. This staff-time could be funded initially by a grant, but ultimately should be permanent and internally-funded. If the BAAQMD decides to offer another round of Climate Protection grants, the County could apply to fund staffing that would identify grants and other funding sources and work with the Climate Change Working Group to develop permanent, ongoing funding.

9. Monitoring Progress

The County should conduct **interim inventories** of municipal GHG emissions to monitor progress toward the reduction targets, possibly every 5 years in accordance with the 2030 target milestones. Additional research proves that the County possesses the ability to quickly monitor municipal GHG emissions using only data and software kept internally.

The 2006 municipal emissions inventory was completed using two methods: a method based on usage data, which generated the data shown earlier in this report; and a method based on cost data (which can be obtained easily from the County's own Auditor's Office and the software program *Utility Manager*) coupled with price assumptions. This "cost method" was completed in less than one week, and generated results that were very similar to those generated by the more detailed "usage method."

Table 9.1 compares the results derived by these two data collection methods. The municipal GHG emissions total derived by the cost method is only 2% less than that derived by the usage method. Furthermore, the most policy-relevant data from the inventory is the source composition (or the percentage of emissions that come from each source), as this informs which sources should be the focus of reduction efforts. The similarity of the source composition between the two methods suggests that the cost method can predict the results of the usage method with acceptable accuracy. This implies that the cost method can be used for future municipal inventories to easily and accurately monitor progress toward the reduction target. The cost method is consistent with the alternate methods described in the Local Government Operations Protocol designed by ICLEI and the ARB. While Table 9.1 does not include emissions from employee commute, the Transportation Planning Section has the data and tools necessary to estimate the cost of employee fuel purchases for commute.

Table 9.1 2006 municipal GHG emissions derived by the usage and cost methods

Source	Usage MTCO ₂ e	Usage % of total	Cost MTCO ₂ e	Cost % of total
Energy Use	20,128	66%	19,706	66%
Electricity	12,227	40%	12,729	42%
Natural gas	7,667	25%	6,751	22%
Propane (jail kitchens)	207	1%	211	1%
Diesel (generators)	27	0%	16	0%
Vehicle Fleet	8,502	28%	8,582	29%
Gasoline	7,460	24%	7,477	25%
Diesel	696	2%	799	3%
B20 biodiesel	218	1%	228	1%
CNG	127	0%	78	0%
Landfilled Waste	1,976	6%	1,726	6%
Total	30,606	100%	30,014	100%

Thus, the County could supplement periodic usage method inventories with more frequent cost method inventories to measure its progress toward its reduction targets.

Appendices

Appendix A. US Cool Counties Climate Stabilization Declaration

IN THE MATTER OF CONTRA COSTA COUNTY ADOPTING THE US COOL COUNTIES CLIMATE STABILIZATION DECLARATION:

WHEREAS, there is a consensus among the world's leading scientists that global warming caused by human emission of greenhouse gases is among the most significant problems facing the world today;

WHEREAS, documented impacts of global warming include but are not limited to increased occurrences of extreme weather events (i.e., droughts and floods), adverse impacts on plants and wildlife habitats, threats to global food and water supplies – all of which have an economic impact on communities and their local governments;

WHEREAS, leading scientists have projected that stabilization of climate change in time to minimize such impacts will require a reduction of global warming emissions to 80 percent below current levels by the year 2050;

WHEREAS, currently the United States is responsible for producing approximately 25 percent of the world's global warming pollutants;

WHEREAS, many leading US companies that have adopted greenhouse gas reduction programs to demonstrate corporate and operational responsibility have also publicly expressed preference for the federal government to adopt precise and mandatory emissions targets and timetables as a means by which to provide a uniform and predictable regulatory environment to encourage and enable necessary and long-term business investments;

WHEREAS, state, regional and local governments throughout the United States are adopting emissions reduction targets and programs and that this effort is bipartisan, coming from Republican and Democratic leadership;

WHEREAS, the US Conference of Mayors has endorsed the US Mayors Climate Protection Agreement, which commits cities to reduction of global warming emissions to 7 percent below 1990 levels by 2012, and calls for a federal limit on emissions;

WHEREAS, the State of California has mandated statewide reduction of greenhouse gas emissions to 80 percent below 1990 levels by 2050;

WHEREAS, more than 100 county leaders signed a letter written by Dane County, Wisconsin, that was sent to the President in March 2006 calling for increased energy investment and development of jobs focused on clean energy technologies;

WHEREAS, counties have a unique role to play in reducing greenhouse gas emissions and preparing for the impacts of climate change through their regional jurisdiction over policy areas such as air quality, land use planning, transportation, zoning, forest preservation, water conservation, and wastewater and solid waste management;

WHEREAS, the economic arguments for implementing climate solutions are compelling, from the near-term economic gains of energy efficiency to the long-term climate stabilization that can prevent irreparable harm from catastrophic climate change impacts;

WHEREAS, many counties throughout the nation, both large and small, are reducing global warming pollutants through programs that provide economic and quality of life benefits such as reducing energy bills, preserving green space, implementing better land use policies, improving air quality, promoting waste-to-energy programs, expanding transportation and work choices to reduce traffic congestion, and fostering more economic development and job creation through energy conservation and new technologies;

NOW, THEREFORE BE IT RESOLVED, that the County of Contra Costa declares that we as Cool Counties will take immediate steps to help the federal, state, and our governments within our county to achieve the 2050 climate stabilization goal by making the following commitments:

- i. Create an inventory of our county government (operational) greenhouse gas (“GHG”) emissions and implement policies, programs and operations to achieve significant, measurable and sustainable reduction of those operational GHG emissions to help contribute to the regional reduction targets as identified in paragraph ii;
- ii. Work closely with local, state, and federal governments and other leaders to reduce county geographical GHG emissions to 80 percent below current levels by 2050, by developing a GHG emissions inventory and regional plan that establishes short-, mid-, and long-term GHG reduction targets, with recommended goals to stop increasing emissions by 2010, and to achieve a 10 percent reduction every five years thereafter through to 2050.
- iii. Urge Congress and the Administration to enact a multi-sector national program of requirements, market-based limits, and incentives for reducing GHG emissions to 80 percent below current levels by 2050. Urge Congress and the Administration to strengthen standards by enacting legislation such as a Corporate Average Fuel Economy (“CAFE”) standard that achieves at least 35 miles per gallon (mpg) within 10 years for cars and light trucks.

BE IT FINALLY RESOLVED, that the County will take immediate steps to identify regional climate change impacts; we will draft and implement a county plan to prepare for and build resilience to those impacts.

The above resolution was adopted by the Contra Costa County Board of Supervisors on October 2, 2007.

Appendix B. Assumptions and Calculations

In the following lists, existing and planned measures are indicated by letter and potential measures by number. Existing measures are also indicated by their number from the November 2005 Report (or by a dash if they were assigned no number) in parentheses. Measures that are *not* followed by a description of methods were not included in calculations, but are still listed in order to present a full list of measures that may reduce GHG emissions.

While activity data could be obtained directly for some existing measures, many existing measures and all proposed measures required assumptions and calculations to extrapolate their associated reductions in activity data.

The detailed descriptions below are meant to aid other local governments in calculating the associated costs and GHG reductions for their own municipal GHG reduction measures. Whenever possible, an annual reduction metric is provided (and marked by an asterisk), in the form of a per-unit average that can be applied to the individual data of other local governments.

Energy Efficiency, Renewable Energy, and Green Building

Existing Measures

A. (6a) Performed seven facility-level and two county-wide energy assessments.

B. (3a) Installed direct digital control systems for HVAC systems in 33 major County facilities and new County buildings & remodels.

Based on electricity and natural gas reductions from DDC systems in County data, the average annual reduction is about 1.21 kWh per square foot and 0.116 therms per square foot.

** 1.21 kWh per square foot of building*

** 0.116 therms per square foot of building*

The sum of the total or partial square footage of all 33 buildings with DDC systems, depending on the extent of the system, is about 1,799,069 square feet. Based on the above metrics, this yields an annual reduction of 2,167,724 kWh and 208,143 therms.

Total annual reduction of 1,620 MTCO₂e

C. (3b) Improved, retrofitted and replaced HVAC systems in 15 selected County buildings.

County data shows an annual reduction of 1,017,568 kWh and 45,004 therms.

** See Measure 1 for metrics*

Total annual reduction of 479 MTCO₂e

D. (-) Implemented heat recovery projects for the Regional Medical Center and the Pittsburgh Health Center.

County data shows that heat recovery projects at the Regional Medical Center, which has a total GSF of 228,000, resulted in an annual reduction of 44,351 kWh and 2,592 therms.

** 0.195 kWh per square foot of building*

** 0.011 therms per square foot of building*

The Pittsburgh Health Center has a total GSF of 130,900. Using the above metrics, this yields a total annual reduction of 69,814 kWh and 4,080 therms for the two buildings.

Total annual reduction of 38 MTCO₂e

E. (4a) Installed state-of-the-art lighting technology and systems in 7 selected County facilities.

County data shows an annual reduction of 1,271,421 kWh.

** See Measure R for metrics*

Total annual reduction of 298 MTCO₂e

F. (13a) Participate in energy demand response programs for 20 selected County facilities.

This program covers 20 buildings and has the capability of reducing 1000 kW. The County's Energy Manager estimates that it actually reduces about 400 kW in each of 12 six-hour-long events each year. This yields an annual reduction of 28,800 kWh.

** 28.8 kWh per kW reduction capacity*

Total annual reduction of 7 MTCO₂e

G. (5a) Installed variable frequency motor drive technology in 9 County (most possible) buildings.

County data shows an annual reduction of 245,421 kWh.

** 27,269 kWh per building*

Total annual reduction of 57 MTCO₂e

H. (5b) Installed vending misers on 60 vending machines.

County data shows an annual reduction of 87,600 kWh.

** 1,460 kWh per vending machine*

Total annual reduction of 20 MTCO₂e

I. (-) Install LEDs in about 50-percent of building exit signs.

County data shows an annual reduction of 404,615 kWh. Also, LEDs use 85-percent less energy than conventional alternatives (Kho 2008).

** 85-percent of sign electricity use*

Total annual reduction of 95 MTCO₂e

J. (17/18) Use LEDs in traffic and pedestrian signals.

LEDs have been installed in almost all traffic signals and in 70-percent of pedestrian signals, with the remaining pedestrian signals being replaced with LEDs as they fail. In 2006, after most LED installation, the annual electricity use for signal accounts was about 421,028 kWh. LEDs use 85-percent less energy than conventional alternatives (Kho 2008). This yields an annual reduction of 2,385,825 kWh of electricity use (see calculations below).

** 85-percent of signal electricity use*

Current kWh represents the current electricity use for LED signals

Baseline kWh represents the electricity use for the same signals before LED replacement

An 85% reduction means that current kWh = 15% of baseline kWh

421,028 kWh = 0.15X where X is baseline kWh

$X = 421,028 / 0.15 = 2,806,853 \text{ kWh}$

Annual reduction = baseline kWh – current kWh

Annual reduction = 2,806,853 – 421,028 = 2,385,825 kWh

Total annual reduction of 558 MTCO₂e

K. (7a) Designed and installed cogeneration plants for the Martinez Detention Facility and the West County Detention Facility.

County data shows an annual reduction of 1,788,000 kWh.

** See Measure U for metrics*

Total annual reduction of 418 MTCO₂e

L. (8a) Installed solar panels on the rooftops of the Martinez Detention Facility and 50 Douglas.

County data shows an annual reduction of 346,928 kWh.

** See Measure 5 for metrics*

Total annual reduction of 81 MTCO₂e

M. (2a) Design energy usage in 3 new County buildings to be at least 10% below California's Title 24 requirements.

N. (10a) Use cool roofing systems for selected County buildings.

On average, cool roofing systems reduce building air conditioning electricity use by 10 to 30-percent, or total building electricity use by three to 10-percent (Stern 2006). The total electricity usage of the affected buildings (based on a building list from the County's General Services Department) in 2006 was 2,075,112 kWh. Assuming a seven percent reduction in building electricity use, this yields an annual reduction of 156,191 kWh of electricity use (see calculations below).

** Seven percent of total building electricity use*

Current kWh represents the current electricity use for the affected buildings with cool roofs

Baseline kWh represents the electricity use for the same buildings before cool roofing

A 7% reduction means that current kWh = 93% of baseline kWh

2,075,112 kWh = 0.93X where X is baseline kWh

$X = 2,075,112 / 0.93 = 2,231,303$ kWh

Annual reduction = baseline kWh – current kWh

Annual reduction = 2,231,303 – 2,075,112 = 156,191 kWh

Total annual reduction of 37 MTCO₂e

O. (10b) Standard for cool roofing systems in new County buildings and remodels.

P. (12a) Install thermally resistant window films on selected County facilities.

Thermally resistant window films reduce total building energy use by 10 to 15-percent (Piper 2004).

** 12-percent of total building energy use*

The total energy usage of the affected buildings (based on a building list from the County's General Services Department) in 2006 was 4,925,419 kWh and 196,213 therms. Assuming a 12-percent reduction in energy use, this yields an annual reduction of 671,648 kWh and 26,756 therms of energy use (see calculations below).

Current kWh represents the current electricity use for the affected buildings with window films

Baseline kWh represents the electricity use for the same buildings before window films

A 12% reduction means that current kWh = 88% of baseline kWh

4,925,419 kWh = 0.88X where X is baseline kWh

$X = 4,925,419 / 0.88 = 5,597,067$ kWh

Annual reduction = baseline kWh – current kWh

Annual reduction = 5,597,067 – 4,925,419 = 671,648 kWh

Current therms represents the current natural gas use for the affected buildings

Baseline therms represents the natural gas use for the same buildings before window films

A 12% reduction means that current therms = 88% of baseline therms

196,213 therms = 0.88X where X is baseline therms

$X = 196,213 / 0.88 = 222,969$ therms

Annual reduction = baseline therms – current therms

Annual reduction = 222,969 – 196,213 = 26,756 therms

Total annual reduction of 300 MTCO₂e

Q. (25) Use water conserving landscaping and irrigation systems.

Planned Measures

R. Expanding lighting improvement program to 14 additional County facilities.

In Measure E, seven buildings with a total GSF of 1,076,616 experienced a total annual reduction of 1,271,421 kWh.

** 1.18 kWh per square foot of building*

This measure expands this program to another 14 buildings with a total GSF of 633,425.

Total annual reduction of 175 MTCO₂e

S. Will install LEDs in the remaining 50% of building exit signs.

This is the same as the associated existing measure, resulting in an annual reduction of 404,615 kWh.

** See Measure I for metrics*

Total annual reduction of 95 MTCO₂e

T. Conducting pilot studies on LED streetlight technology.

U. Designing and installing cogeneration plants for the Regional Medical Center and the Juvenile Hall, which operate 24-hours per day.

In Measure K, two buildings with a total GSF of 421,642 experienced a total annual reduction of 1,788,000 kWh.

** 4.24 kWh per square foot of building*

This measure expands this program to two additional facilities with a total GSF of 319,412. This metric yields an annual reduction of 1,354,487 kWh.

Total annual reduction of 317 MTCO₂e.

Potential Measures

1. Expand HVAC improvement and retrofit program to 50 additional County buildings.

In Measure C, 15 buildings with a total GSF of 811,625 experienced an annual energy use reduction of 1,017,568 kWh and 45,004 therms.

** 1.25 kWh per square foot of building*

** 0.055 therms per square foot of building*

This measure would expand this program to 50 additional buildings, each with an assumed GSF of about 50,000 (based on the GSF of the buildings already included in the program), for a total of 2,500,000 GSF.

Potential annual reduction of 1,475 MTCO₂e

Implementation cost: \$0.185/SF x 50,000 SF/building x 50 buildings = \$462,500

2. Expand lighting improvement program to 30 additional County buildings.

In Measure E, seven buildings with a total GSF of 1,076,616 experienced a total annual reduction of 1,271,421 kWh.

** 1.18 kWh per square foot of building*

This measure would expand this program to another 30 buildings with the average County building GSF of 25,000, yielding an annual reduction of 885,706 kWh.

Total annual reduction of 207 MTCO₂e

Implementation cost: \$0.40/SF x 25,000 SF/building X 30 buildings = \$300,000

3. Create an employee energy awareness program to promote energy conservation and efficient use of County facilities.

Assume that this program could reduce building energy use by five percent.

** Five percent of total building energy use*

** Five percent of GHG emissions from building energy use*

Potential annual reduction of 951 MTCO₂e

4. Install LEDs in all county-owned streetlights (if pilot studies are successful).

LEDs use 85-percent less energy than conventional alternatives (Kho 2008).

** 85-percent of lighting electricity use*

** 85-percent of GHG emissions from streetlight energy use*

Potential annual reduction of 704 MTCO₂e

5. Install additional solar systems at the West County Detention Facility, the Buchanan Airport Field, the Pleasant Hill Library, and the Elections Office.

In Measure L, two buildings with a total installed capacity of 300 kW reduced annual electricity use by 346,928 kWh.

** 1,156 kWh per kW of installed capacity*

According to the County's Energy Manager, the appropriate installed capacity of these potential systems would be 300 kW for the West County Detention Facility and the Buchanan Airport

Field, 100 kW for the Pleasant Hill Library, and 85 kW for the Elections Office, for a total of 785 kW. This yields a potential annual reduction of 907,795 kWh.

Potential annual reduction of 212 MTCO₂e

6. Install thermally resistant window films on 30 additional existing County facilities.

Thermally resistant window films reduce total building energy use by 10 to 15-percent (Piper 2004).

** 12-percent of total building energy use.*

The average building energy use of County buildings is 288,068 kWh and 8690 therms. Reducing the energy use of 30 average buildings by 12-percent would yield an annual reduction of 1,037,043 kWh and 31,284 therms.

Potential annual reduction of 410 MTCO₂e

Implementation cost: \$7.25/SF x 6,250 SF/building x 0.6 x 30 buildings = \$815,625 (see below)

According to the County's Energy Manager, installation of window film costs about \$7-10/SF of window area with rebates of \$1.25/SF, yielding a final price of about \$7.25/SF of window area. Window film is usually only applied on sun-facing sides of building for about 60-percent of building window area. According to the County's Energy Manager, window area is usually about 15 to 30-percent of floor area (assume 25-percent), so an average County building with a floor area of 25,000 GSF would have about 6,250 SF of window area. This measure would affect 60-percent of this area on 30 buildings for a total of 112,500 SF of window area.

Environmentally Preferable Purchasing

As the GHG inventory does not include a lifecycle analysis of GHG emissions from procurement activities, it would be inconsistent to credit emissions reductions from the purchase of products with recycled-content materials or otherwise environmentally-friendly manufacturing processes. However, it should be noted that environmentally preferable purchasing holds great potential to reduce emissions from the manufacturing process. Emissions reductions from the purchase of products with the potential to reduce energy use are credited because energy use is included in the GHG inventory.

Existing Measures

V. (41) Include pricing for environmental specifications in the process of requiring bids for building materials.

W. (42a) Require contractors/vendors to provide recycled-content/recyclable products.

X. (38) Standard for Allsteel 50% recycled-content, 99% recyclable office furniture.

Y. (40) Purchased 100,000 square yards of 50% recycled-content, 100% recyclable carpeting for County buildings.

Z. (37c) More than 100 items on the county office supply contract have been replaced with recycled-content equivalents.

AB. (37b) Purchased recycled-content office paper (35% of paper).

AC. (37a) Purchased recycled-content toner cartridges (45% of cartridges).

AD. (36a) Require that all County business cards produced by General Services be printed on recycled-content paper.

AE. (-) Adopted an Environmentally Preferable Purchasing Policy.

Planned Measures

AF. Purchasing high efficiency motors, appliances, and equipment as they fail.

AG. All county copier contracts require the placement of Energy Star copiers.

According to County buyers, there are about 1500 copiers used in County buildings. The average large copier uses about 2800 kWh per year, assuming 10 hours of operation per day. According to the Energy Star website, Energy Star copiers use about 50-percent less electricity than standard models due to imaging efficiency and shut-off mode.

** 50-percent of copier electricity use*

This yields an annual reduction of $1500 * 2800 * 0.5 = 2,100,000$ kWh.

Total annual reduction of 491 MTCO₂e

AH. Standard for EPEAT certified Dell desktop computers.

According to the County's Purchasing Manager, there are about 7000 computers used in County buildings. Using the EPEAT Electronics Environmental Benefits Calculator, replacement of these computers with EPEAT alternatives reduces energy use by 5,350,000 kWh.

** Calculator available at <http://www.epeat.net/FastBenefits.aspx>*

Total annual reduction of 1,252 MTCO₂e

Vehicle Fleet

Existing Measures

AI. (34) Minimize purchase of sport utility vehicles.

AJ. (35) Capture evacuated mobile air conditioning emissions.

The emissions factors used for vehicle transportation in ICLEI's tool do not include emissions from mobile air conditioning, so emissions from mobile air conditioning are not included in the GHG inventory. Thus, it would be inconsistent to include reductions from measures aimed to reduce mobile air conditioning emissions.

AK. (-) All 168 diesel fleet vehicles changed to B20 biodiesel fuel in September 2006.

Assume all 2006 diesel and B20 biodiesel consumption (98,233 gallons) changes from diesel to B20 biodiesel.

Total annual reduction of 247 MTCO₂e

** 1.47 MTCO₂e per diesel vehicle*

AL. (29) Purchased 12 electric vehicles

Dividing the total annual fleet gasoline consumption by the number of gasoline vehicles (991) yields an average of about 831.5 gallons per vehicle. Multiplying this by the 12 vehicles in this measure yields a total of 9,978 gallons of fuel switched from gasoline to electric. According to ICLEI, the energy equivalent of a gallon of gasoline is 35 kWh, so this is equivalent to 349,230 kWh of electricity.

** 832 gallons of gasoline reduced per electric vehicle*

** 35 kWh of electricity per gallon of gasoline*

** 29,103 kWh of electricity added per electric vehicle*

Total annual reduction of 9 MTCO₂e

AM. (30a) Purchased 86 hybrid (gasoline and electric) fleet vehicles.

The County's Fleet Manager estimates that 22,722 gallons of gasoline fuel are avoided per year due to hybrid use, based on the exact hybrid models and the vehicles that they replaced.

** See Measure 7 for metrics*

Total annual reduction of 206 MTCO₂e

AN. (32a) Install a "fast fill" CNG fueling facility.

AO. (31a) Purchased 39 compressed natural gas (CNG) vehicles.

A total of 17,561 gallons of fuel switched from diesel to CNG.

** See Measure 8 for metrics*

Total annual reduction of 50 MTCO₂e

Planned Measures

AP. Purchased 29 FlexFuel vehicles, and 13-14 patrol cars will be replaced with FlexFuel equivalents each year.

Potential Measures

7. Purchase 100 more hybrid vehicles for the fleet.

In Measure AM, the purchase of 86 hybrid vehicles led to an annual reduction of 206 MTCO₂e (based on an estimate by the County Fleet Manager of 22,722 gallons of gasoline fuel avoided).

** 2.40 MTCO₂e per hybrid vehicle*

Potential annual reduction of 240 MTCO₂e

Additional implementation cost: (90 sedans x \$3,000/sedan) + (10 SUVs x \$6,000/SUV) = \$330,000

Assume a mixture of 90 hybrid sedans and 10 hybrid SUVs. Each hybrid sedan adds about \$3,000 over the cost of a standard non-hybrid vehicle. Since the vehicles are being procured to replace older retired vehicles, the additional cost to add hybrids to the fleet may be estimated at \$3,000 per vehicle. Each hybrid SUV adds about \$6,000 over the cost of a comparable non-hybrid SUV.

8. Purchase 50 more CNG vehicles for the fleet.

In Measure AO, the purchase of 39 CNG vehicles led to an annual reduction of 50 MTCO₂e. This yields an average annual reduction of 1.28 MTCO₂e per CNG vehicle.

** 1.28 MTCO₂e per CNG vehicle*

Potential annual reduction of 64 MTCO₂e

Additional implementation cost: (30 sedans x \$3,000/sedan) + (20 vans x \$17,500/van) = \$440,000

Assume a mixture of 30 dedicated CNG sedans and 20 dedicated CNG vans. CNG sedans add about \$3,000 over a non-hybrid sedan. CNG vans add \$17,500 over the purchase of a standard gasoline van.

9. Install an above-ground 5,000-gallon E85 ethanol fuel tank for the County's 70 FlexFuel vehicles as well as other users (CHP and CALTRANS).

Based on County fuel consumption and vehicle inventory data from baseline year 2006, the average County gasoline fleet vehicle consumes 832 gallons of gasoline each year. For each FlexFuel vehicle, this gasoline would be replaced with the 832 GGEs of E85 ethanol fuel.

** 7 MTCO₂e per E85-fueled FlexFuel vehicle*

It is estimated that the County will have close to 70 E85 capable Flex Fuel Vehicles in service by the end of 2008.

Potential annual reduction of 490 MTCO₂e (and growing with additional Flex Fuel vehicles)

Employee Commute

Analysis for the following measures is based on results from the 2003 Contra Costa County Employee Commute Survey, which was conducted by the Transportation Planning Section in conjunction with 511 Contra Costa. An additional survey was conducted in 2007, and the preliminary results available at the time of this report illustrated very similar results to the 2003 survey. Thus, the 2003 values are considered to be stable and accurate for current conditions. The potential reductions from many of these measures are based on assumptions which may differ from actual conditions and presume that all other variables remain the same.

Existing Measures

AQ. (51a) Offer financial incentives to County employees for using transit or forming a new carpool.

According to Table 1 of the 2003 Employee Commute Survey, 9% of employees carpool and 2% of employees take public transit to work. Assume that this will reduce the VMT of the participating employees by 75% (with an average carpool/transit size of 4 individuals as verified by Transportation Planning). Assume that all personal commuting uses gasoline fuel. In 2006, employee commute was responsible for a total of 47,818,925 VMT. This yields an annual reduction of 15,780,245 VMT (see calculations below).

This affects 11% of total employee VMT

Current affected VMT = $0.11 \times 47,818,925 = 5,260,082$ VMT

Current affected VMT represents the VMT for employees who use carpool or transit

Baseline affected VMT represents the VMT for the same employees before carpool or transit

A 75% reduction means that current affected VMT = 25% of baseline affected VMT

$5,260,082 \text{ VMT} = 0.25X$ where X is baseline affected VMT

$X = 5,260,082 / 0.25 = 21,040,327$ VMT

Annual reduction = baseline affected VMT – current affected VMT

Annual reduction = $21,040,327 - 5,260,082 = 15,780,245$ VMT

** See Measure 11 for metrics*

Total annual reduction of 7,764 MTCO₂e

Note: The County also provides 30 free preferred parking stalls for County employees' vehicles used for carpooling (55a), which could also encourage the commute patterns described in the survey above.

AR. (50a) Provide financial incentives to County employees participating in a vanpool (25% off monthly costs).

According to Table 1 of the 2003 Employee Commute Survey, 1% of employees vanpool to work. Assume that this will reduce the VMT of the participating employees by 89% (with an average vanpool size of 9 individuals as verified by Transportation Planning). In 2006, employee commute was responsible for a total of 47,818,925 VMT. This yields an annual reduction of 3,868,986 VMT (see calculations below).

This affects 1% of total employee VMT

Current affected VMT = $0.01 \times 47,818,925 = 478,189$ VMT
 Current affected VMT represents the VMT for employees who vanpool
 Baseline affected VMT represents the VMT for the same employees before vanpool
 An 89% reduction means that current affected VMT = 11% of baseline affected VMT
 $478,189 \text{ VMT} = 0.11X$ where X is baseline affected VMT
 $X = 478,189 / 0.11 = 4,347,175$ VMT
 Annual reduction = baseline affected VMT – current affected VMT
 Annual reduction = $4,347,175 - 478,189 = 3,868,986$ VMT

Total annual reduction of 1,904 MTCO₂e

** 1,904 MTCO₂e per % of employees*

** 22.6 MTCO₂e per employee*

AS. (56a) Provide bicycle lockers and/or racks at work sites to encourage County employees to bike to work.

According to Table 1 of the 2003 Employee Commute Survey, 0.5% of employees bike to work. Assume that this will reduce the VMT of the participating employees by 100%. In 2006, employee commute was responsible for a total of 47,818,925 VMT. This yields an annual reduction of 239,095 VMT (see calculations below).

Annual reduction = $0.005 \times 47,818,925 \text{ VMT} = 239,095$ VMT

Total annual reduction of 118 MTCO₂e

** 236 MTCO₂e per % of employees*

** 2.80 MTCO₂e per employee*

Note: The County also provides shower facilities at certain work sites to encourage County employees to bike, walk or run to work (57a), which could also encourage the commute patterns described in the survey above.

AT. (52a) Allow County employees to work using flex schedules and compressed work weeks.

According to Table 12 of the 2003 Employee Commute Survey, 54% of employees work flex schedules, most with 9-80 schedules. Assume that this will reduce the VMT of the participating employees by 10% (one day out of every ten work days). In 2006, employee commute was responsible for a total of 47,818,925 VMT. This yields an annual reduction of 2,869,136 VMT (see calculations below).

This affects 54% of total employee VMT

Current affected VMT = $0.54 \times 47,818,925 = 25,822,220$ VMT

Current affected VMT represents the VMT for employees who use flex schedules

Baseline affected VMT represents the VMT for the same employees before flex schedules

A 10% reduction means that current affected VMT = 90% of baseline affected VMT

$25,822,220 \text{ VMT} = 0.9X$ where X is baseline affected VMT

$X = 25,822,220 / 0.9 = 28,691,355$ VMT

Annual reduction = baseline affected VMT – current affected VMT

Annual reduction = $28,691,355 - 25,822,220 = 2,869,136$ VMT

* See Measure 12 for metrics

Total annual reduction of 1,412 MTCO₂e

AU. (49a) Implement Telecommuting Program for employees to reduce vehicle trips.

According to Table 1 of the 2003 Employee Commute Survey, 0.2% of employees telecommute. Assume that this will reduce the VMT of the participating employees by 40% (two days out of every week or five work days). In 2006, employee commute was responsible for a total of 47,818,925 VMT. This yields an annual reduction of 63,759 VMT (see calculations below).

This affects 0.2% of total employee VMT

Current affected VMT = $0.002 \times 47,818,925 = 95,638$ VMT

Current affected VMT represents the VMT for employees who telecommute

Baseline affected VMT represents the VMT for the same employees before telecommuting

A 40% reduction means that current affected VMT = 60% of baseline affected VMT

$95,638 \text{ VMT} = 0.6X$ where X is baseline affected VMT

$X = 95,638 / 0.6 = 159,396$ VMT

Annual reduction = baseline affected VMT – current affected VMT

Annual reduction = $159,396 - 95,638 = 63,759$ VMT

* See Measure 13 for metrics

Total annual reduction of 31 MTCO₂e

Potential Measures

Note that over sixty percent of County employees commute more than 10 miles to work, and thirty percent commute over 20 miles. This should be taken into consideration before the metrics for measures 10 - 13 are used by other local governments.

10. Institute a user fee for parking spaces owned or leased by the County and allocate the surplus revenue to incentives for use of commute alternatives.

Researchers who have analyzed case studies in the United States and Canada suggest that at least 20-percent of commuters who now drive alone would choose to carpool or use public transit if employers required them to pay market rates for parking they now receive free. Thus, assume that this measure would increase use of mass transit and carpooling by 20% of employees. In existing measure 51a, participation by 11% of employees led to an annual reduction of 5,254 MTCO₂e.

* 478 MTCO₂e per % of employees

* 5.67 MTCO₂e per employee

An increase in use by 20% of employees would yield a potential annual reduction of 9,553 MTCO₂e

Implementation Cost: \$786,375

56 pay stations at \$9,000 (including installation): \$504,000

Painting numbers on parking stalls	50,000
100 Parking Signs @ \$250 each	25,000
3 Handheld enforcement devices (two included)	3,500
Total Materials:	582,500
Program Design/Engineering @ 10%	58,250
Contingency @ 25%	145,625
Total Implementation Cost:	\$786,375

Annual Operating Cost: \$324,300

Software maintenance charge	\$4,440
Wireless communication charge	36,960
Warranty	32,900
Maintenance Tech (1)	100,000
Enforcement/Collections Tech (2)	150,000
Total Operating Cost	\$324,300

Annual Revenue: \$1,981,980

In downtown Martinez, parking meters charge \$0.25 per hour. The fee amounts to \$2.25 per day for employees that work 8 to 5. This translates into monthly revenue of \$48.75, or \$585 annually for each parking space. Applying this fee structure to all County-owned or leased off-street parking spaces involves the following assumptions.

3,388 parking spaces x \$585/space = \$1,981,980 annual revenue

11. Allow County employees to use pre-tax dollars to pay for mass transit or carpool expenses.

Based on expressed employee willingness in the 2003 Employee Commute Survey to switch commute alternatives based on pre-tax payroll deductions, assume that this would increase use of mass transit and carpooling from 11% to 30% of employees, a difference of 19% of employees. In existing measure 51a, participation by 11% of employees led to an annual reduction of 5,254 MTCO₂e.

* 478 MTCO₂e per % of employees

* 5.67 MTCO₂e per employee

An increase in use by 19% of employees would yield a potential annual reduction of 9,075 MTCO₂e

Note that this reduction may not be additional to the reduction in Measure 10, as the same employees could be influenced by both measures. It should also be noted that expressed willingness to change behavior can be higher than actual behavior upon implementation.

12. Institute compressed work weeks in all County departments.

This would increase use of flex schedules from 54% to 100% of employees, a difference of 46% of employees. In existing measure 52a, participation by 54% of employees led to an annual reduction of 1,412 MTCO₂e.

- * 26.2 MTCO₂e per % of employees
- * 0.310 MTCO₂e per employee

An increase in use by 46% of employees would yield a potential annual reduction of 1,203 MTCO₂e

13. Expand the telecommuting program by identifying opportunities to increase employee participation to 30%.

Based on expressed willingness to telecommute in the 2003 commute survey, this could increase use of telecommuting from 0.2% to 30% of employees, a difference of 29.8% of employees. In existing measure 49a, participation by 0.2% of employees led to an annual reduction of 31 MTCO₂e.

- * 155 MTCO₂e per % of employees
- * 1.84 MTCO₂e per employee

An increase in use by 29.8% of employees would yield a potential annual reduction of 4,619 MTCO₂e

Note that expressed willingness to change behavior can be higher than actual behavior upon implementation.

Waste Reduction and Recycling

As the baseline GHG inventory only considers methane production from landfilled waste, for consistency, the reductions in the waste sector only include avoided methane. However, it should be noted that recycling and waste reduction also hold other reduction potentials, including the carbon sequestration of trees that are not consumed for paper production, the avoided energy use of new paper production, and the avoided transportation to landfill sites.

Existing Measures

Av. (47a) Recycle paper from about 200 County buildings.

County data shows an annual reduction of 1,634 tons in 2005.

- * 8.17 tons per building

Total annual reduction of 520 MTCO₂e

AW. (47b) Collect and Recycle beverage containers from over 50 County buildings and parks.

County data shows an annual reduction of 3 tons in 2005. *Note that the program has grown significantly since 2005, so the actual reduction is probably higher.*

- * 0.06 tons per park or building

Total annual reduction of 1 MTCO₂e

AX. (44a) Conduct an ongoing program to facilitate reuse and recycling of office furniture and equipment from County buildings.

County data shows an annual reduction of 41 tons in 2005.

Total annual reduction of 3 MTCO₂e

AY. (48) Recycle municipal landscaping debris

Recyclers pick up 20 cubic yards of greenwaste three times per month. Based on a volume to weight conversion factor provided by ICLEI (one cubic yard = 600 pounds), this yields an annual reduction of 196 tons of waste.

Total annual reduction of 16 MTCO₂e

AZ. (45b) Direct consulting architects and engineers to reuse as much of the existing structures and building materials as possible.

BA. (45a) Require contractors to recycle waste from building/remodeling projects whenever feasible.

Potential Measures

14. Set the default on all copying and printing machines to duplex (double-sided) mode.

This measure would decrease paper disposal by half. The County's Purchasing Manager estimates that the annual amount of white copy paper purchased for copying and printing machines exceeds 50 tons. Thus, this measure would reduce paper waste disposal by at least 25 tons.

According to County buyers, there are about 1500 copying and printing machines used in County buildings.

** 0.033 tons of paper per copying/printing machine*

Potential annual reduction of 87 MTCO₂e

15. Divert organic waste from parks and landscaping to on-site compost.

Research conducted by CalRecovery, Inc. estimates that the generation of green waste from the grounds-keeping activities of GSD is approximately 170 tons per year.

StopWaste.Org's 2007 Climate Action Plan Template, which was developed for Alameda County, estimates that this type of measure could avoid twelve 50-mile trips by heavy diesel trucks or 600 VMT annually.

Potential annual reduction of 16 MTCO₂e (avoided landfill) + 1 MTCO₂e (avoided VMT)

Total Reductions

Reduction from existing measures = 16,289 MTCO₂e = 23% of baseline

Reduction from planned measures = 2,330 MTCO₂e = 3% of baseline

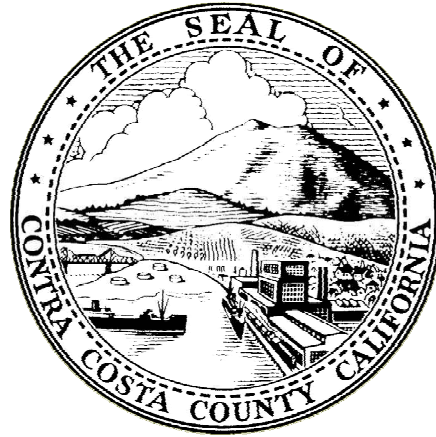
Reduction from existing and planned measures = 18,619 MTCO₂e = 26% of baseline

Reduction from potential measures = 26,919 MTCO₂e = 37% of baseline

Reduction from existing, planned, and potential measures = 45,538 MTCO₂e = 63% of baseline

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Cover image of Briones Regional Park in Contra Costa County

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